JUPITER AND HIS MARKINGS.

DURING the last few years, Jupiter has been situated so far south of the equator that telescopic observations have had to be pursued under all the disadvantages inseparable from viewing an object at a low altitude. But the conditions are now much improved; the planet, though still in south declination, will be some 11° north of his position in 1890, and will therefore remain much longer above the horizon, and present a better defined and larger disk than during the few preceding oppositions, so that the study of his surface-markings may be resumed under very encouraging circumstances.

The great red spot has been visible and its appearance and movements closely watched during thirteen years, for it was in July 1878 that it was first announced as a striking object. But it probably existed long before this, for the drawings of previous observers include forms which have a very suggestive resemblance to the red spot, though they are under a less conspicuous aspect. There is, in fact, little doubt that this marking is an old feature, but it is liable to considerable variations of tint, inducing obvious changes in its general appearance as presented to telescopic observers. Layers of cloud, moving with unequal velocities and at different elevations above the surface of the planet, probably overlap the spot and partially obliterate it at times, but its definite elliptical outline has been always preserved, and its dimensions have not varied materially. It is the colouring of the spot that has exhibited inconstancy, and especially that of the central region, which changed from a brick-red in 1878–81 to a very light tint, differing little, if at all, from the other parts of the planet's disk in the same latitude. But the margin of the spot has been more durable, and it was visible for several years as a pink ellipse, offering a great similarity to the ellipse seen by Gledhill in 1869–70.

After a somewhat precarious existence, the spot appears to be recovering prominence, though its present aspect will not bear comparison with the features it presented about twelve years ago. Still it is now a fairly conspicuous marking, with a depth of tint far more pronounced than in the years 1884–85. The central part of the spot appears to have regained the reddish hue, and the general appearance of the object is sufficiently marked to recall the grand views it afforded at the period of its best display.

The variable motion of the spot has formed one of its most interesting attributes, and I give below a table of the mean rotation-period deduced from observations during the last eleven oppositions of Jupiter:—

Limiting dates.	Rotations.	Period.		
		h.	m.	s.
1879 July 10—1880 Feb. 7	512	9	55	34·2
1880 Sep. 27—1881 Mar. 17	413	9	55	35·6
1881 July 8—1882 Mar. 30	640	9	55	38·2
1882 July 29—1883 May 4	674	9	55	39·1
1883 Aug. 23—1884 June 12	710	9	55	39·1
1884 Sep. 21—1885 July 8	700	9	55	39·2
1885 Oct. 24—1886 July 24	659	9	55	41·1
1886 Nov. 23—1887 Aug. 2	609	9	55	40·5
1888 Feb. 12—1888 Aug. 22	462	9	55	40·2
1889 May 28—1889 Nov. 26	439	9	55	40 0
1890 May 22—1890 Nov. 25	451	9	55	40·2

On August 7, 1891, I re-observed the spot with a 10-inch reflector, power 252, and found it well-defined and fairly conspicuous. It passed the central meridian of the planet at 11h. 32m., so that it followed Marth's zero meridian (System II.) only 3 minutes. This nearly agrees with two observations by Mr. A. S. Williams in May last, which placed the spot 4 minutes behind the zero meridian. Mr. Marth's computations are to be found in the *Monthly Notices* for March 1891, and they supply a valuable guide to all students of Jovian phenomena.

Apart from the red spot, it is desirable that the white spots near the planet's equator, and the similar markings which verge the northern side of the north equatorial belt, should be assiduously followed, and their individual rotation periods ascertained from a number of fresh observations. These markings are severally controlled by proper motions of very irregular character, and some singular alternations of visibility also affect them. Mr. Williams finds that the equatorial white spots have exhibited a great slackening of speed in recent years. This variation apparently affects the entire equatorial zone, and it will be important to determine the exact extent of it, and whether it is sustained in the present year. The changes of velocity alluded to are scarcely progressive in the same direction; we may expect to find an acceleration sooner or later to compensate for the relatively slow movement of the spots in the few past years. It is not unlikely that the various markings show oscillations of speed recurring at uniform intervals.

Students of this interesting planet will find abundance of materials to collate and discuss. There is ample evidence of the reappearance of certain features after periods of non-visibility. Some of the more durable markings apparently suffer temporary obscuration by vaporous masses suspended above them in the Jovian atmosphere. The disposition of the belts is also liable to changes, though not so rapidly as is generally supposed, for many of the alleged variations have been due to differences in telescopic definition or to the rapid rotation of the planet; circumstances which have not always been adequately allowed for.

W. F. DENNING.

SCIENTIFIC SERIALS.

American Journal of Science, August.—Some of the features of non-volcanic igneous ejections, as illustrated in the four "Rocks" of the New Haven region, West Rock, Pine Rock, Mile Rock, and East Rock, by James D. Dana. A few of the conclusions arrived at from the observations recorded in this paper are that igneous eruptions occurred in the New Haven region after the sandstone had been upturned. The liquid rock forced its way between layers of the sandstone, and lifted it up where the pressure of the rock was not too great to prevent the upheaval. This intrusive action was favoured by the fact that the fissure supplying the lava was inclined in the same direction as the layers of the uplifted sandstone. And the foliation of the underlying schists did not determine the course and dip of the supply fissures. The paper is illustrated by several excellent photographs of the formations investigated.—Note on a reconnaissance of the Ouachita mountain system in Indian territory, by Robert T. Hill.—The continuity of solid and liquid, by Carl Barus. By means of the simple arrangement described in this paper, the author is able to obtain at once the isothermals and isopiestics, and therefore the isometrics, both for the solid and liquid states of the substances experimented upon. The relation of solidification and fusion to pressure and the pressure changes of the isothermal specific volumes of solid and liquid at the solidifying and melting points can also be determined. And from such results the character of fusion and the probable position of critical and transitional points can be found. The author has as yet only investigated the behaviour of naphthalene by his method, but the whole work throws considerable light upon the relation of pressure to phenomena of fusion and solution.—Note on the asphaltum of Utah and Colorado, by George H. Stone. The author has visited all the known asphalte fields of Western Colorado and North-Eastern Utah. The observations he has made bear upon the origin of petroleum, asphalte, natural gas, and other subterranean hydrocarbons, but the facts are hardly sufficient to lead to definite conclusions.—Photographic investigation of prominences and their spectra, by George E. Hale. Account is given of the methods employed by the author for the photography of invisible solar prominences. Special attention has been directed to the photography of the bright prominence lines running through H and K, with a slit tangential to the sun's limb. Four reproductions of negatives showing prominences illustrate the paper.—A gold-bearing hot spring deposit, by Walter Harvey Weed. A microscopical and chemical examination of some specimens of ore from the Mount Morgan Gold Mine, Queensland, demonstrates that the mine is a deposit of a hot spring, the ore being a siliceous sinter impregnated with auriferous hæmatite. This is the only hot spring deposit that has been found to contain gold in commercially valuable quantities, and although the sinter deposits from the hot springs of Yellowstone Park resemble those from Mount Morgan, no trace of the precious metals has been found in them.—Restoration of Stegosaurus, by O. C. Marsh. The species restored is *Stegosaurus ungulatus*, from the Upper Jurassic of Wyoming. A plate, representing the reptile one-thirtieth its natural size, accompanies the paper.

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The *American Meteorological Journal* for July contains the following articles:—Franklin's kite experiment, by A. McAdie. After giving various details respecting Franklin's experiments, the author describes similar experiments recently carried on at the Blue Hill Observatory, near Boston, U.S., the chief advance being that at every step the electrical potential of the atmosphere was measured by an electrometer. The kite was sent up on several days, and at a height of 1000 feet sparks over $\frac{1}{8}$ inch in length were obtained; while abnormal movements of the stream of water from the electrometer during electrical disturbance always foretold when a flash of lightning was about to occur.—Cloud heights and velocities at Blue Hill Observatory, by H. H. Clayton. This paper contains the results of cloud observations made at Mr. A. L. Rotch's Observatory during the last five years. The average heights of some of the principal clouds were: *nimbus* 412 metres, *cumulus* (base) 1558 m., false *cirrus* 6500 m., *cirro-stratus* 9652 m., *cirrus* 10,135 m. The cumulus is highest at Blue Hill during the middle of the day. The Upsala observations show that the base of the cumulus, as well as the cirrus, increases in height until evening, but neither of these conclusions apply to the observations at Blue Hill. The average velocity found for the cirrus (82 miles an hour) is twice as great as that found at Upsala. The extreme velocity was found to be 133 miles an hour. A comparison between wind and cloud velocity shows that below 500 metres the wind velocity is less than the cloud velocity. Above that, the excess of the cloud velocity increases up to 1000 metres, and then decreases again till about 1700 metres, after which it steadily increases. This decrease between 1000 and 1700 metres is very probably due to the fact that the clouds between 700 and 1000 metres were mostly observed during the morning, when the cumulus moves most rapidly, and that the clouds between 1000 and 1700 metres were mostly observed during the afternoon, when the cumulus moves slowest.—Meteorological kite-flying, by W. A. Eddy. This is an account of some experiments made at Bergen Point, New Jersey, to determine the vertical extension of warm air currents by means of self-recording thermometers carried by a kite string. Experiments showed that an altitude of 1800 feet could be obtained by using one kite, and that many hundred feet could be added to the altitude by lifting the weight of slack string by fastening on larger kites. It is estimated that by this means an altitude of 4000 feet was obtained. The minimum temperature at an altitude of about 1500 feet, on February 14 last, was only 2° lower than at the surface.

SOCIETIES AND ACADEMIES.

Paris.

Academy of Sciences, August 24.—M. Duchartre in the chair.—Remarks on the dynamic conditions of the development of cometary tails, by Dom Et. Siffert.—*Résumé* of solar observations made at the Observatory of the Roman College during the second quarter of 1891, by M. Tacchini.—On cyclic systems, by A. Ribaucour.—A property of involution, common to a group of five right lines and a system of nine planes, by M. P. Serret.—On the tension of water-vapour up to 200 atmospheres, by M. Ch. Antoine. From the expression $t = \frac{1638 - 0{\cdot}0005P^2}{5{\cdot}0402 - \log P} - 225$, deduced from the experimental results of MM. Cailletet and Colardeau, the author deduces formulæ for the calculation of P to a first approximation, by the aid of the general formula $P = G\left(\frac{T - \lambda}{T}\right)^a$, given by J. Bertrand to express the tension of vapours. The formulæ given are:—

$$P^1 = [0{\cdot}0058824\,(t + 70)]^{6{\cdot}0} \text{ applicable from } 0^\circ\text{–}100^\circ;$$
$$P^1 = [0{\cdot}0064516\,(t + 55)]^{5{\cdot}5} \text{ applicable from } 50^\circ\text{–}200^\circ;$$
$$P^1 = [0{\cdot}0071069\,(t + 41)]^{5{\cdot}0} \text{ applicable from } 220^\circ\text{–}365^\circ.$$

The value P^1 is then used in Cailletet's formula to calculate P, of which tabulated values are given.—On the rejection, by the liver, of bile introduced into the blood, by M. E. Wertheimer. The author has examined the bile of dogs before and after the injection under varying conditions of sheep's bile. The characteristic absorption spectrum of cholohæmatine, a colouring matter not present in the bile of the dog, but always a constituent of sheep's bile, was invariably found in bile secreted by the dog's liver after injection; thus an indisputable proof is given that the liver takes out bile constituents from the blood, and passes them into the alimentary canal unaltered.

Brussels.

Academy of Sciences, July 4.—M. Plateau in the chair.—On hoar frosts, by M. Folie. Some observations of the ravages caused by frosts which occurred on June 12 and 13 indicate that, if the cultures of the Ardennes are to be preserved from such disastrous effects, the plateau must be again planted with trees. The frosts appear to have had more effect near the soil than at some metres above it.—On one of M. Servais's theorems, by M. E. Catalan.—On an extension of M. Hermite's law of reciprocity, by M. Jacques Deruyts.—On two new Lerneopodians, one of which is found at the Azores, and the other on the coast of Senegal, by M. P. J. Van Beneden. Description is given of male and female *Brachiella chavuii* found at the Azores, and of male and female *Brachiella chevreuxii* from the coast of Senegal. The description is accompanied by a plate.—On a method of generation of the cubic surface, by M. F. Deruyts.

Sydney.

Royal Society of New South Wales, July 1.—H. C. Russell, F.R.S., President, in the chair.—Eighteen new members were elected, and the following papers were read:—On Nos. 13 and 14 compressed-air flying machines, by Lawrence Hargrave.—Some folk-songs and myths from Samoa, translated by the Rev. G. Pratt, with introductions and notes by Dr. John Fraser.—On a cyclonic storm in the Gwydir district, and Preparations now being made in Sydney Observatory for the photographic chart of the heavens (illustrated by photographs), by H. C. Russell, F.R.S., Government Astronomer.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

British Cicadæ, Part 7: G. B. Buckton (Macmillan).—Bibliotheca Botanica (Wesley).—British Oligocene and Eocene Mollusca in the British Museum (Natural History): R. B. Newton (London).—Fossil Botany: H. Graf zu Solms-Laubach; translated by H. E. F. Garnsey, revised by I. B. Balfour (Oxford, Clarendon Press).—Synopsis der Hoeheren Mathematik, Erster Band: J. G. Hagen (Berlin, Dames).—Missouri Botanical Garden Second Annual Report (St. Louis, Mo.).—Blackie's Science Readers, Nos. 2, 4, and 5 (Blackie).—Free Land: Dr. T. Hertzka, translated by A. Ransom (Chatto and Windus).—A Sketch of the Vegetation of British Baluchistan: J. H. Lace and W. B. Hemsley (London).—Bulletins de la Société d'Anthropologie de Paris, January and February, March and April (Paris, Masson).—Papers and Proceedings of the Royal Society of Tasmania for 1890 (Hobart).

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